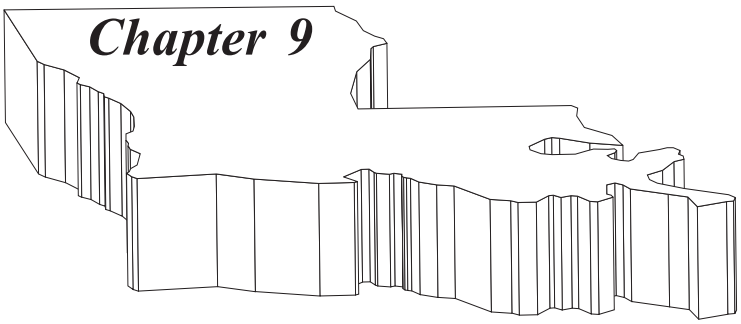
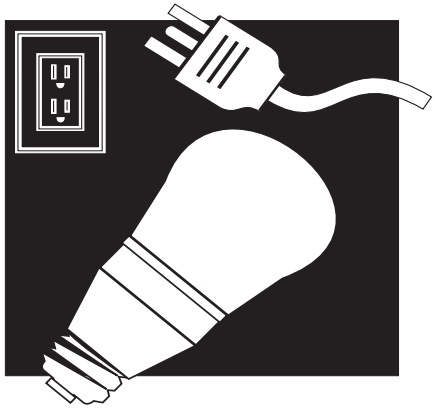




Water Heating, Appliances and Lighting

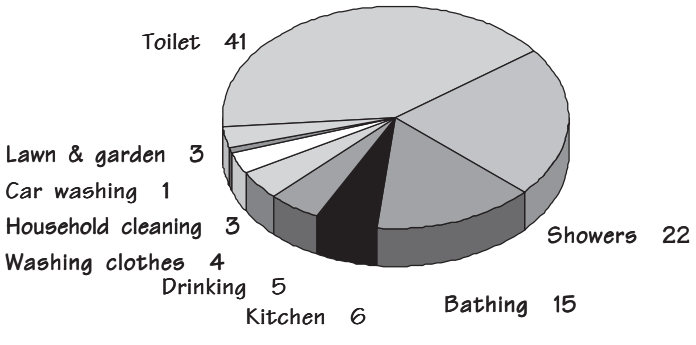
Energy costs for water heating can be as great as those for heating or cooling a house. An average family of four in Louisiana will spend about $300 to $400 annually for electric or propane water heating and $125 to $200 for natural gas. However, it is easy to cut those bills dramatically with conservation measures and water heating alternatives.

Energy Conservation for Water Heating

No matter what type of energy source is used to heat water, be certain to take advantage of the savings from conservation measures:

- ❒ Lower the temperature setting on the water heater to 120°F.
  - ❍ Saves energy
  - ❍ Reduces the risk of injury from scalding
  - ❍ Provides plenty of hot water
  - ❍ If hotter temperatures are needed for dish washing, select dishwashers with booster heaters.
- ❒ Wrap the outside of the water heater tank with an insulation jacket.
  - ❍ Simple to install — payback less than 1 year
  - ❍ Do not cover the relief or drain valve
  - ❍ For gas water heaters, do not block the air inlet to the burner or the flue vent on the top
- ❒ Insulate at least four feet of all pipes connected to unit, but pipe insulation is inexpensive and the slit foam tube type is easy to apply. Therefore, it will pay to insulate as much of the outlet run that is accessible. If the inlet pipes are exposed to cold temperatures, insulate those, too.
- ❒ Low-flow showerheads provide about a 1-year payback. Well designed fixtures deliver water at 2.5 or fewer gallons per minute and still provide plenty of force.
- ❒ Heat traps (Figure 9-2) keep hot water from circulating freely out of the water heater.

Figure 9-1
Water Use in Typical Homes
(In Gallons per Day)



Source: "Water delivery crisis as severe as drought," Atlanta Constitution, June 21, 1988, page 10A.

- ❒ Low-flow aerators on sink and lavatory faucets
  - ❍ Save on energy bills
  - ❍ Kitchen sink may need a higher volume flow faucet for filling pots and pans more quickly

SELECTING AN EFFICIENT WATER HEATER

Water heaters come in a range of efficiencies, warranties, and fuel sources. Their efficiencies are measured by a rating known as the *energy factor* (EF).

Gas Water Heaters

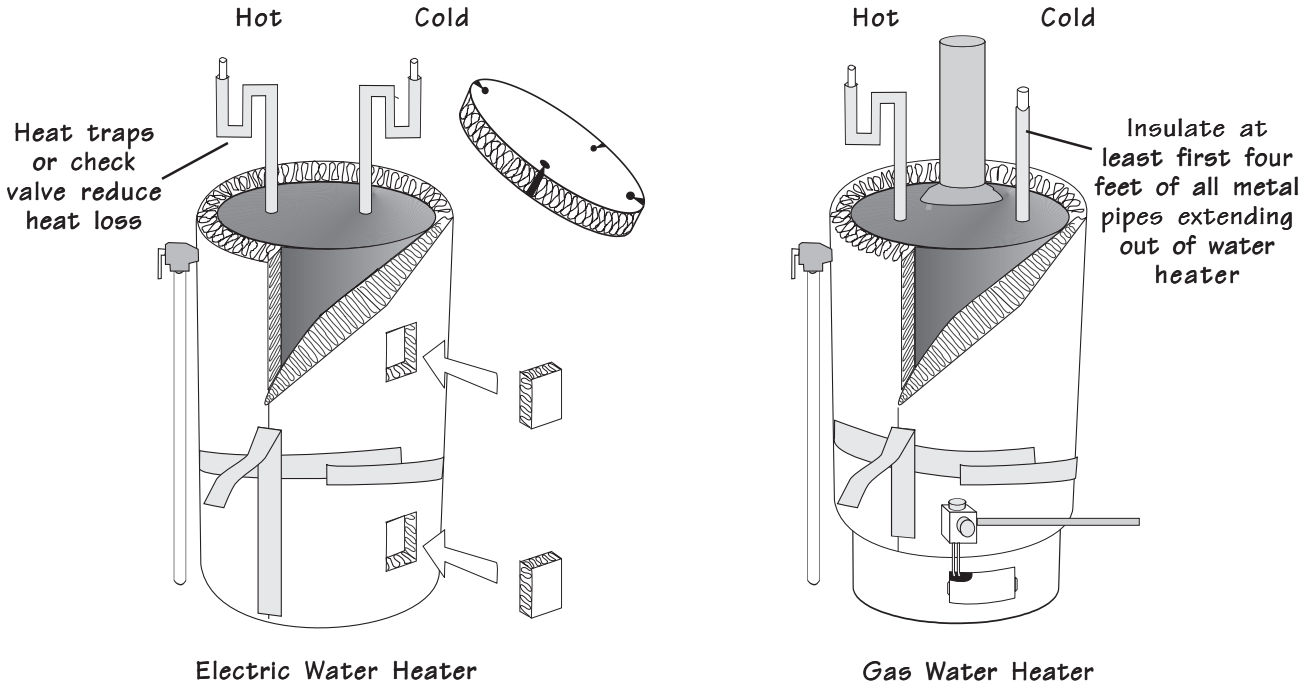
Higher efficiency gas water heaters have energy factors over 0.80. In addition to variations in insulation, gas water heater efficiency is also affected by burner design, the shape of the flue baffles which slow the hot

Table 9-1
Energy Factors for High Efficiency Water Heaters*

Size of Unit (gallons)	Energy Factor Range
Gas-Fired	
30	0.54 - 0.64
40	0.61 - 0.86
50	0.73 - 0.83
Electric Resistance	
30	0.91 - 0.95
40	0.91 - 0.94
50	0.90 - 0.94
60-66	0.90 - 0.94
80	0.89 - 0.92

*Source: Alex Wilson and John Morrill. ***Consumer Guide to Home Energy Savings***. American Council for an Energy Efficient Economy. Washington, DC. 1995.

Figure 9-2
Insulating Jackets for Electric and Gas Water Heaters



exhaust gases down to increase heat transfer to the water, and the amount of surface area between the flue gases and the water.

Higher efficiency gas water heaters have blowers for venting and delivery of combustion air. Most of these units can be vented out of the sidewall of the home rather than the roof because of the forced air blower.

Fuel-fired water heaters should be located in unconditioned spaces that are isolated in terms of pressure and air leakage from the living area. Examples include crawlspaces, attics, and unconditioned basements.

If fuel-fired water heaters are located in interior spaces, such as interior mechanical rooms connected to conditioned spaces or laundry rooms, they should include provisions for outside combustion air, such as a direct-vent unit. Direct-vent units have a double flue pipe that includes both an intake for combustion air and a flue for exhaust gases.

More sophisticated energy features found on high efficiency furnaces, such as electronic ignition, flue dampers, and condensing heat exchangers, are being introduced into domestic water heaters.

When shopping for a water heater, use the *Energy Guide* sticker to compare the estimated annual energy cost for a specific water heater with comparable models. The estimated annual cost shown in bold print on the sticker uses the national average cost of fuel, which could differ significantly in your area.

Electric Water Heaters

For electric water heaters, higher efficiency units have Energy Factors up to 0.97. Often, the additional cost of a high efficiency unit is quite low compared to the savings. Because of the high cost of electric water heating, more efficient options such as heat recovery units, heat pump water heaters, and solar water heaters should always be considered.

Heat recovery units

A *heat recovery unit*, also called a *desuperheater*, recovers excess heat from an air conditioner or heat pump to provide "free" hot water. The heat is captured from the refrigerant line between the outside condenser and the inside equipment (see description of how air conditioners work in Chapter 7). A heat exchanger mounted on this line extracts heat from the superheated, high pressure, refrigerant gas, which is hot enough to be able to lose some heat and still not begin to condense into a liquid.

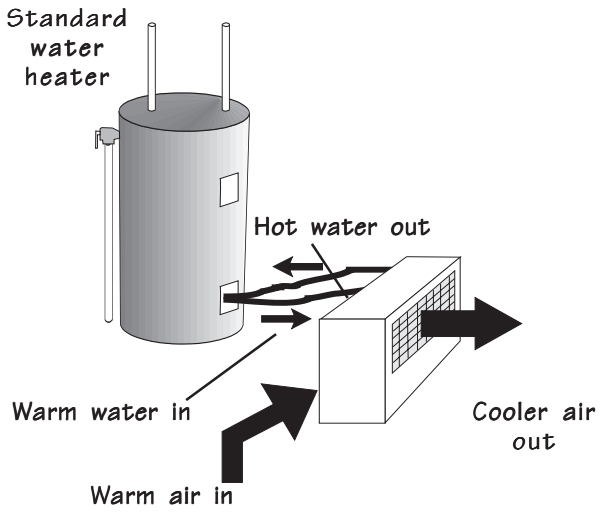
During the summer, the desuperheater can usually provide 100 percent of the hot water needs of a family and improve the efficiency of the air conditioner or heat pump. In the spring and fall, with no need for heating or cooling, the desuperheater is ineffective. In the winter, if connected to a heat pump, the desuperheater can still provide hot water more efficiently than a conventional electric water heater. The energy savings from a desuperheater connected to a central air conditioner depend on how often the air conditioner is used. Savings are typically 20 to 40% on annual water heating bills.

The size and efficiency of the water heater and cooling equipment will affect the performance of a desuperheater. Combining desuperheaters with new higher efficiency air conditioners or heat pumps, which have lower refrigerant temperatures, can reduce the energy savings. The HVAC system should be at least 2 tons in size to be used effectively with a desuperheater. Desuperheaters range in cost from $550 to $750 and save $50 to $180 annually. Before installing a unit, make sure it will not void warranties on mechanical equipment.

Heat pump water heaters

Heat pump water heaters operate at about twice

Figure 9-3
Heat Pump Water Heaters



the efficiency of standard electric water heaters. They cost $700 to $1,200 installed and can save $100 to $200 each year.

Heat pump water heaters use surrounding air as a heat source. As they extract heat from the air, they provide some dehumidification and cooling — about 40,000 Btu per day for a typical house. While the cool dry air is an advantage in summer, it is detrimental in winter. It is best to locate the unit in an unconditioned area, such as an unheated basement, where the cooling effect will not cause winter discomfort or higher heating bills. The area must stay above 45°F for the unit to operate properly. To avoid damaging the equipment, never install a heat pump water heater in areas where the temperature drops below freezing.

Heat pump water heaters are sold either as separate cabinets which are connected to a conventional water heater or as packages complete with the hot water storage tank. When operating, they are about as loud as an air conditioner, so do not locate them where noise will be a problem.

Solar Water Heaters

For homes that use a large amount of hot water and receive full sun year-round, solar water heaters may be economical. Most solar water heaters operate by preheating water for a standard water heater. Normally, gas or electric water heaters bring incoming cold water to a desired temperature of about 120°F. A solar water heater uses sunlight to preheat cold water and stores it, often at temperatures well above 120°F.

If the solar-heated water is hot enough, the standard water heater does not need to add more heat. If the water is cooler than needed, the standard water heater will operate as a backup to increase the temperature. Thus, the temperature or availability of hot water is never affected. Of course, even when the solar-heated water is at temperatures below 120°F, the backup unit will use less energy than it would to heat incoming cold water.

A variety of solar water heaters are available commercially, most of which should last 15 years or longer. They are divided into three categories: active, thermosiphon, and batch. In *active* and *thermosiphon* water heaters, solar panels or collectors trap the sun's heat. Water or other fluid running through the collectors absorbs heat and increases in temperature. The liquid then travels to a storage tank where the heat it gains is stored.

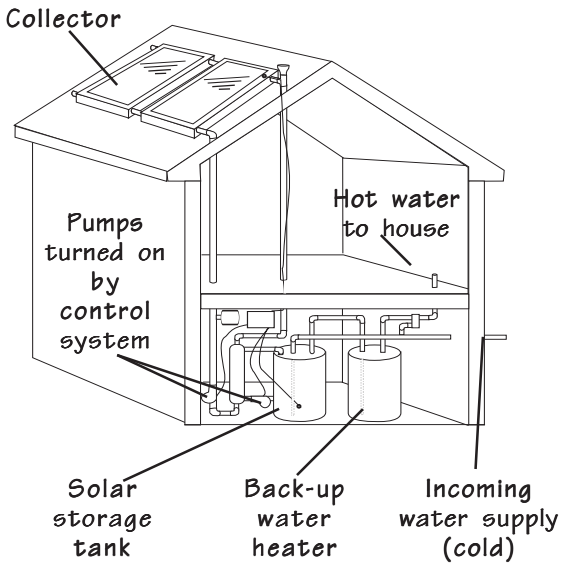
Active systems use electric pumps to move the water from the collectors to the storage tank. Thermosiphon water heaters require no outside power because they use the natural tendency of water to rise as its temperature increases to push water from the collectors to the storage tank, which must be located higher than the collectors.

Some solar water heaters use a single, large storage tank that has a backup source of water heating. Other systems use a standard water heater as a backup and a separate solar storage tank. Active and thermosiphon systems cost from $1,500 to $5,000 and supply up to 70 percent of a family's annual hot water needs.

The tilt angle of the glazing — the angle between the glazing and the horizon — should be within 15 degrees of the latitude. For Louisiana, the tilt angle can be between 18 and 50 degrees. The best tilt angle for a year-round solar device, such as a solar water heater, is 35 to 45 degrees. For solar collectors used only for winter heating, tilt angles can be raised to between 50 and 60 degrees.

Solar water heaters must be protected from freezing. Active and thermosiphon systems use nonfreezing fluids or automatic drain systems to prevent freezing.

Figure 9-4
Active Solar Water Heating Systems



Batch water heaters, also called breadbox water heaters, are simpler than active or thermosiphon systems. However, they provide less hot water, usually about 15 to 40 percent of a family's yearly demand. Batch water heaters combine the collector and storage tank in one box. The box has insulated sides, a clear cover, and one or more tanks inside. In some cases, large tubes are used instead of tanks. A batch water heater can typically store 30 to 60 gallons of hot water.

On a sunny day, sunlight travels through the glazing of the batch unit and strikes the tanks, which are flat black in color. In most cases, the tanks are covered with a special selective surface coating that readily absorbs sunlight, but reduces heat loss from the tank. When the tanks absorb the sun's energy, the water inside heats up. Local water pressure pushes the solar-heated water into the regular water heater whenever a fixture or appliance, such as a shower or dishwasher, is drawing hot water.

Batch heaters are manufactured and sold commercially. Prices range from about $800 to $1,200. However, because of the simplicity of the design, some people build their own.

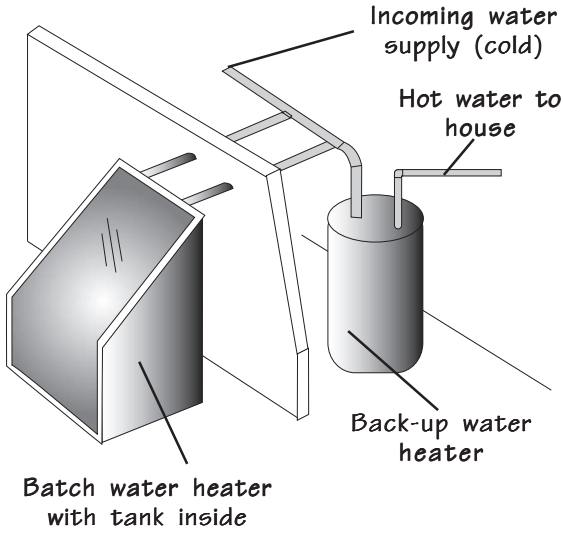
The collectors for any type of solar water heater should be located as close as possible to the water heater tank to minimize the connecting piping. The glazing should face within 45 degrees of due south.

Collectors are usually located on the roof, but they can be attached to supports on the side of a house or on the ground. Because batch water heaters combine collectors, storage tanks, and water, they are heavy. Adequate structural support must be provided when they are located on the roof.

Water inside the tanks of a batch water heater will only freeze on bitterly cold nights. However, the water in the pipes that connect the batch heater to the inside can freeze at temperatures around 32°F. A special *freeze prevention drip valve* should be used on a batch water heater.

Solar water heating can provide year round savings. Households that use a large amount of hot water and can adapt the time when hot water is used to match when it is available will benefit the most. Savings will be greatest if laundry, dishes, and bathing are done between noon and early evening — after the sun has heated the water stored in the tank.

Figure 9-5
Batch Solar Water Heating System

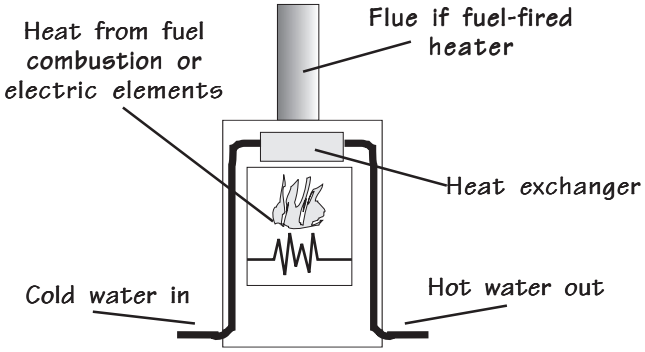


Instantaneous Water Heaters

Instantaneous water heaters use higher capacity electric coils or gas burners to heat cold water only when there is a need for hot water. They save energy in two ways: they have no storage tank so there is no need to keep stored water continuously warm, and gas-fired burners on these units usually heat water more efficiently than gas tank-type water heaters. Conventional water heaters keep 30 to 50 gallons of water at a constant temperature — 24 hours a day.

Instantaneous units must be sized carefully for their planned use. A small unit may provide heating for only one faucet or appliance at a time, so a higher capacity model or several units are generally needed to provide hot water for conventional residential uses. By eliminat-

Figure 9-6
Instantaneous Water Heater



ing the standby losses and increasing efficiency, instantaneous water heaters may save 10 to 20 percent of a household's usual water heating bill.

The units range in cost from $250 to $800. In general, instantaneous water heaters are not particularly cost-effective investments. It is usually more economical to use conservation measures such as low-flow showerheads, insulated tank jackets, reduced thermostat settings to lower standby losses, and to install conventional, high efficiency water heaters.

Energy Efficient Appliances

Heating, cooling, and hot water are usually the biggest portion of energy needs in Louisiana homes. However, the cost of operating major appliances is significant. In the average home, energy bills range from $200 to $400 each year to run refrigerators and freezers, clothes washers and dryers, ranges and ovens, and other appliances.

While most new appliances offer a wide variety of features, many models are not designed to be energy efficient. When choosing appliances, it is important to consider their operating costs — how much energy they require to run — as well as the purchase price and the various features and conveniences they offer.

Appliances which operate efficiently may cost more to buy, but the energy savings they provide make them a good investment. For example, running a standard refrigerator over its life of 15 to 20 years costs about three times as much as its purchase price. An energy efficient model can save hundreds of dollars over the life of the appliance. Table 9-2 shows typical annual energy costs for a variety of appliances.

In addition to saving money on operating costs, energy efficient appliances give off less waste heat than standard models. Therefore, they help keep rooms inside the house cooler during warm weather.

The National Appliance Energy Conservation Act (NAECA), which upgraded the efficiencies of heating, cooling, and hot water systems, also required improvements in appliance efficiencies. The last round of refrigerator standards took effect in January 1, 1993. As a result, a typical refrigerator of today uses less than 800 kilowatt-hours (Kwh) per year — less than half of that for a typical 1973 model.

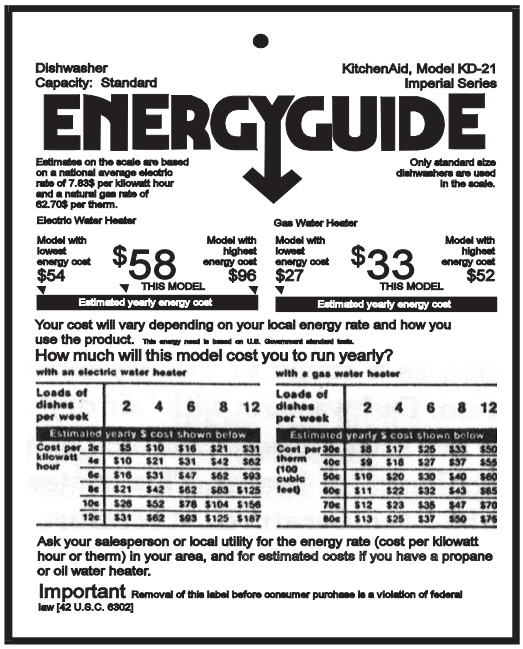
Table 9-2
Typical Energy Costs for Appliances*

Appliance	Average Model ($/yr)	High Efficiency Model ($/yr)	10-Year Savings
Refrigerator (manual defrost)	56	36	$200
Refrigerator/freezer (frost free)	96	56	400
Freezer (frost free)	108	60	480
Electric range	48	40	80
Gas range	36	28	80
Electric clothes dryer	56	44	120
Gas clothes dryer	24	20	40
Dishwasher**	56	36	200
Color Television	20	8	120
Lighting	60	28	320

*Adapted from "Saving Energy and Money with Home Appliances," by the Massachusetts Audubon Society and the American Council for an Energy Efficient Economy.

**Includes cost of water heating.

Figure 9-7
EnergyGuide Label



Dishwasher
Capacity: Standard

KitchenAid, Model KD-21
Imperial Series

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 7.83$ per kilowatt hour and a natural gas rate of 62.70$ per therm.

Only standard size dishwashers are used in the scale.

Electric Water Heater

Model with lowest energy cost $54

$58 THIS MODEL

Model with highest energy cost $96

Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost $27

$33 THIS MODEL

Model with highest energy cost $52

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy need is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater

Loads of dishes per week	2	4	6	8	12
Estimated yearly $ cost shown below					
Cost per kilowatt hour 2¢	$5	$10	$16	$21	$31
4¢	$10	$21	$31	$42	$62
6¢	$16	$31	$47	$62	$93
8¢	$21	$42	$62	$83	$125
10¢	$26	$52	$78	$104	$156
12¢	$31	$62	$93	$125	$187

with a gas water heater

Loads of dishes per week	2	4	6	8	12
Estimated yearly $ cost shown below					
Cost per therm (100 cubic feet) 30¢	$8	$17	$25	$33	$50
40¢	$9	$18	$27	$37	$55
50¢	$10	$20	$30	$40	$60
60¢	$11	$22	$32	$43	$65
70¢	$12	$23	$35	$47	$70
80¢	$13	$25	$37	$50	$75

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area, and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of federal law [42 U.S.C. 6302]

ENERGYGUIDE LABEL

To compare the energy usage of an appliance, use the *EnergyGuide label*. Federal law requires that manufacturers display this label on all new refrigerators, freezers, water heaters, dishwashers, clothes washers, and room air conditioners. Energy Guide labels are not currently required on kitchen ranges, microwave ovens, clothes dryers, demand-type water heaters, and portable space heaters.

The large number on the Energy Guide label tells how much that appliance will cost to operate each year based on an estimate of the amount of energy used and an average national energy costs. The rating for a particular model is shown on a line scale that compares its energy cost against the model with the lowest and highest annual energy costs. Much like the federal miles per gallon ratings for automobiles, the actual amount of energy used and its cost will vary according to local prices and each family's lifestyle.

The Energy Guide label also provides the name of the manufacturer, model number, type of appliance, and capacity. It has a yearly cost table that shows a range of energy rates and the total annual cost to operate that particular appliance at each rate. Use exact energy rates from local utilities to estimate operating costs for the appliance.

APPLIANCE SHOPPING CHECKLIST

All Appliances

- ❒ Use EnergyGuide Tag to help select unit. Find the savings in operating costs for more efficient appliances. Divide the savings per year into the extra purchase price to get the payback period. Paybacks of less than five years are generally attractive.

Refrigerators

- ❒ The most efficient models are in the 16 to 20-cubic foot range.
- ❒ Side-by-side refrigerator/freezers use more energy than similarly sized models with freezers on top.
- ❒ Features such as automatic icemakers and through-the-door dispensers add somewhat to energy use.
- ❒ Units that are more square, rather than rectangular, also save energy, but may not be as convenient to use.
- ❒ Manual defrost units save considerably more than frost-free units, but create more work for the homeowner.
- ❒ Look for a power-saving switch that turns off a condensation-prevention heater. Keep this switch off unless the unit experiences significant condensation.
- ❒ A new generation of refrigerators that do not use chlorofluorocarbons (CFCs) exceed the minimum standards of NAECA by about 30% — the result of the electric utility-funded Super Efficient Refrigerator Program (SERP).
- ❒ Try to install the refrigerator in a cooler location — in particular, it should not receive direct sunlight.
- ❒ The refrigerator should operate between 36°F and 38°F, and the freezer should be 0°F to 5°F. Adjust temperatures to this range.

Dishwashers

- ❒ Water heating accounts for about 80% of energy use.
- ❒ Models that use less water need less energy — older units used 8 to 14 gallons per wash cycle compared to the mid-1994 range of 7 to 10 gallons.
- ❒ Should have light, medium, and heavy cycle options — water use for one dishwasher is 7.5 gallons for a light cycle, 11 gallons for medium, and 13 gallons for heavy.
- ❒ Should have an energy saving "air dry" or "no-heat dry" switch.
- ❒ Choose a unit that contains a supplemental or booster water heater; then set your water heater to 120°F. Make certain the unit still provides 160°F to the sanitary cycle if desired.

- ❒ Minimize pre-rinsing of dishes unless necessary; always rinse in cold water.
- ❒ Wash only full loads.

Clothes Washing Machines

- ❒ Choose a machine that offers several wash and rinse cycles and several sizes of loads.
- ❒ Front-loading models feature faster spin cycles, which dry clothes better, and use less water than top-loading models; in addition, front-loading models usually get clothes cleaner.

Clothes Dryers

- ❒ Energy-saving switches and models that detect "dryness" and shut off automatically offer considerable energy savings.
  - ❍ Some units have moisture sensors in the drum, which save about 15% over standard dryers.
  - ❍ Others have a temperature sensor in the dryer exhaust, which saves about 10% over standard units.
- ❒ If clothes that usually need ironing are removed while slightly damp, they can be hung up to save on dryer and ironing energy use.

Cooking

- ❒ Convection ovens are about 1/3 more efficient than standard ovens.
- ❒ Electric cooktops with ceramic glass covers are more efficient than coil or disk electric stoves; induction elements, which use electromagnetic energy to heat the pan, are the most efficient.
- ❒ Avoid large kitchen exhaust fans, especially those for side-vented stoves, which can exhaust 400 to 700 cfm. They can create considerable negative pressures in tight homes and may cause backdrafting of combustion appliances. The code only requires 100 cfm of ventilation. If using large, side-vented units, make certain to supply make-up air to the unit from outside.

LIGHTING

Standard incandescent bulbs are the most common lighting source for homes. However, incandescent lamps are quite inefficient. They convert only 10 percent of the electricity to lighting; the remainder is waste heat. The lighting industry has responded to the need for energy efficiency with a wide range of excellent products. The most notable of these options are:

1. Compact fluorescents that use thin tubes and require only 5 to 29 watts of electricity to provide as much light as standard incandescent lamps. These products can also provide the same quality of light as incandescent lamps.

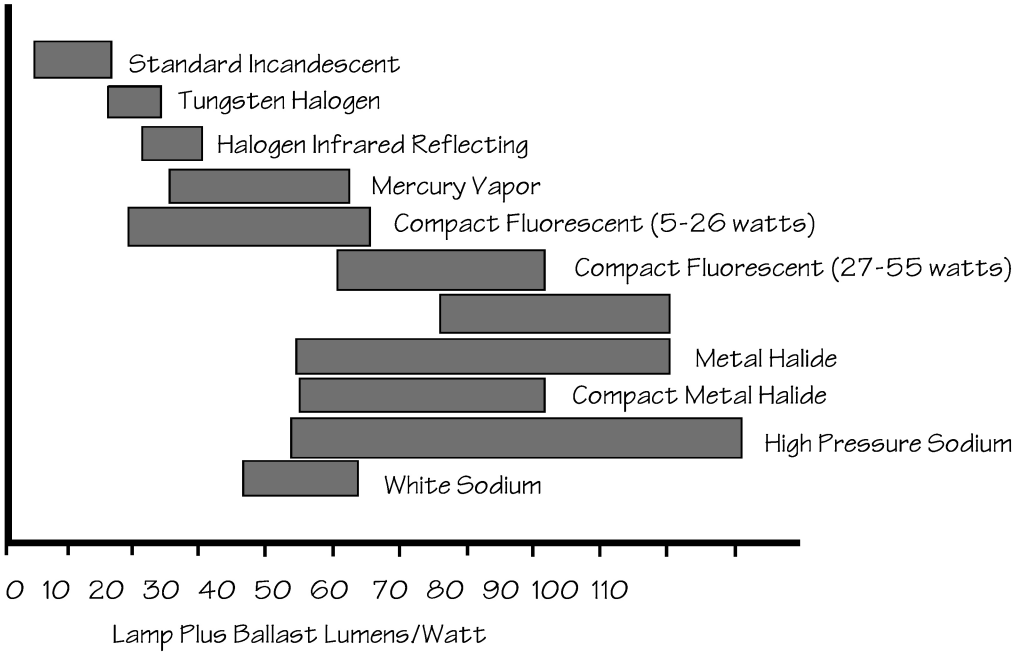
2. Lower wattage fluorescent tubes, along with efficient electronic ballasts, can reduce the energy needed by a standard 2-lamp, 4-foot fixture from 92 watts to about 60 watts. There are many products available with a high color rendition index (CRI), which measures the ability of a lamp to illuminate colors accurately.

3. High pressure sodium and metal halide lamps, mainly intended for exterior use in residences, are four to six times more efficient than standard exterior lamps.

There is great opportunity for originality and ingenuity in residential lighting design. A home combines more functions and needs than most other buildings, yet energy efficient lighting can be achieved at minimal cost. Of course, the needs of each home must be considered individually, but certain conservation measures are applicable to all home designs, including:

- ❒ Energy efficient fixtures and lamps for areas of high continuous lighting use, such as the kitchen, sitting areas, and outside the home for safety and security.
- ❒ Local task lighting for specific activities such as working at a desk, on a kitchen counter, or in a workshop.
- ❒ Accent lighting for areas that need more light enables the overall level of lighting in a room to be reduced.

Figure 9-8
Energy Efficiencies of Lights
(Lumens per Watt)



- ❒ Timers and light-sensitive switches for exterior lighting.
- ❒ Daylighting — using sunlight as the light source in areas normally occupied during the day.
- ❒ Solid-state dimmers and multilevel switches which allow variable lighting levels.

The amount of light a lamp provides is measured in *lumens*. The electrical energy used to provide that light is measured in watts. The lighting level depends upon the efficiency of the light source in converting watts to lumens and the ability of the lighting fixture to distribute the light effectively. High efficiency lamps and lighting fixtures reduce wattage requirements but still provide desired lighting levels.

The efficiency — called the *efficacy* — of a lamp is measured in lumens of light produced per watt of electricity consumed. Fig. 9-8 provides comparative efficacies of different lamp types.

In designing a lighting plan, consult with knowledgeable professionals about optimum lighting levels and different types of fixtures and lamps. Table 9-3 shows sizing guidelines for fluorescent lighting systems.

When choosing lighting fixtures, consider the long term energy costs of the fixture as well as the purchase price. Energy efficient lighting alternatives reduce waste heat in summer, thereby saving money on cooling costs and increasing comfort levels. In addition, they typically last 9 to 10 times longer than standard incandescent lamps.

Table 9-3
Fluorescent Lighting Guidelines
(using T-8 lamps and electronic ballasts)

Type of Room	Size of Room	Amount of Light Needed (Watts)
Living room,	under 150 sq ft	40 to 60
bedrooms, family,	150 to 250 sq ft	60 to 80
or recreation room	over 250 sq ft	.33 watt/sq ft
Kitchen,	75 sq ft	55 to 70
laundry, or	75 to 120 sq ft	60 to 80
workshop	over 120 sq ft	.75 watt/sq ft

Table 9-4 shows a sample lighting comparison between a home with standard, incandescent lighting and a home with a variety of efficient lighting technologies. The energy efficient design costs an extra $210, but saves $160 per year on lighting energy bills. The added investment pays back in 1.3 years and achieves a 60% return on investment.

Table 9-5 shows the purchase and operating costs of a number of lighting options. The different alternatives are grouped by lumen output so lamps for similar uses can be compared. The total cost is determined for a period of 9,000 hours, which is the typical life of a compact fluorescent lamp.

For example, a standard 75-watt incandescent lamp costs $54 for electricity and bulb replacements over 9,000 hours of operation. Compare that to a new, compact fluorescent lamp, which lasts 10,000 hours compared to 1,000 for the incandescent, and costs only $30 to purchase and operate.

Table 9-4
Sample Improved Lighting Design for Homes

	Standard Lighting Design				Energy Efficient Design			
Room	**Type***	**Watts**	**Hours/ day**	**Kwh/ year**	**Extra Cost ($)**	**Type**	**Watts**	**Kwh/ year**
Kitchen	I	150	8	438	30	F	60	175
Living	I	150	6	328	5	H	135	296
Dining (decorative) **	I	75	5	137	-	I	75	137
Bathrooms (2) **	I	200	4	292	-	I	200	292
Hallway	I	150	10	545	30	F	60	219
Bedrooms (3)	I	225	4	328	30	F	66	96
Laundry/ Utility	I	100	4	146	25	F	30	88
Closets (5)	I	300	1	110	-	I	300	110
Porch	I	100	12	438	15	F	60	131
Exterior Floodlight	I	360	12	1,577	100	HPS	150	657
Total Annual Electricity Use (Kwh)				4,339				2,201
Annual Lighting Cost ($ @ $.075/Kwh)				325				165
Estimated Extra Cost for Energy Efficient Lighting					$210			
Payback Period					1.3 years			
Rate of Return on Investment					60%			

* I=incandescent; F=fluorescent; H=halogen; HPS=high-pressure sodium

** Compact or tubular fluorescent fixtures could also be used in these rooms.

Table 9-5
Purchase and Operating Costs of Different Lighting Products
(recommendations in italics)

	Wattage	Typical Purchase Cost ($)	Lumens	Rated Life (Hours)	Efficacy (Lumens/ Watt)	Electricity Cost for 9,000 hours ($)
Incandescent and Fluorescent (cost is for bulb only)						
Standard	60	0.77	870	1,000	15	40
Energy saving (Halogen)	52	0.79	800	1,000	15	35
Compact fluorescent	*15*	*10.00*	*720*	*9,000*	*48*	*12*
Standard	75	0.77	1,210	1,000	16	51
Energy saving (Halogen)	67	0.79	1,130	1,000	17	45
Compact fluorescent	*18*	*12.00*	*1,100*	*10,000*	*61*	*14*
Compact fluorescent	*20*	*14.00*	*1,200*	*10,000*	*60*	*16*
Standard	100	0.77	1,750	750	17	67
Energy saving (Halogen)	90	0.79	1,620	750	18	61
Compact fluorescent	23-27	20-25	Comparable	10,000	64	20
Tungsten-Halogen (cost is for bulb only)						
Small lamp	42	2.52	665	3,500	16	28
Medium-sized lamp	72	2.52	1,300	3,500	18	49
Room Lighting (cost is for bulb & ballast)						
Incandescent fixture with three, 60-watt lamps	180	30	2,610	1,000	15	121
Fluorescent fixture with two 32-watt lamps/electronic ballast	*54*	*42*	*5,500*	*20,000*	*102*	*41*
Three compact fluorescent fixtures -- 24-watts each	*66*	*90*	*4,000*	*10,000*	*102*	*53*
Exterior Fixtures (assuming 4 outdoor fixtures -- cost is for fixture and bulbs)						
Standard PAR lamp (2 lamps/ fixture)	960 for 4 fixtures	60	20,880	2,000	12	648
Tungsten-halogen (2 lamps/ fixture)	720 for 4 fixtures	70	21,600	2,000	20	486
Mercury Vapor (1 lamp/ fixture)	400 for 4 fixtures	120	23,000	24,000	57	270
Metal Halide (1 lamp/ fixture)	250 for 4 fixtures	300	20,500	10,000	82	170
High Pressure Sodium (1 lamp/ fixture)	*200 for 4 fixtures*	*300*	*22,000*	*24,000*	*110*	*135*

Notes: